

SUPPLEMENTARY ONLINE MATERIAL FOR

**First spalacotheriid and dryolestid mammals
from the Cretaceous of Germany**

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Supplementary Online Material

SOM 1. Data matrix for phylogenetic analysis of new dryolestids *Minutolestes submersus* and *Beckumia sinemeckelia* from the Lower Cretaceous (Barremian–Aptian) of Balve, Germany.

SOM 2. Movable 3D surface models of new mammals from the Lower Cretaceous (Barremian–Aptian) of Balve, Germany and of the holotype and paratype of *Crusafontia cuencana*.

3D PDF Instructions

Data and file overview

3D pdf files available at:

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82308_Cifellitherium_r_upper_molar.pdf

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82302_Cifellitherium_r_upper_molar.pdf

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82305_Cifellitherium_r_lower_molar_holotype.pdf

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82306_Minutolestes_l_upper_molar_holotype.pdf

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82304_Minutolestes_l_upper_molar.pdf

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82307_Minutolestes_l_lower_molar.pdf

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82301_Beckumia_l_mandible_holotype.pdf

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82310_Beckumia_l_lower_premolar.pdf

http://app.pan.pl/SOM/app67-Martin_etal_SOM/MfN_Una1_Crusafontia_l_mandible_holotype.pdf

http://app.pan.pl/SOM/app67-Martin_etal_SOM/MfN_Una2_Crusafontia_r_mandible_paratype.pdf

SOM 1.

Data matrix

xread

48 19

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Tinodon_bellus      0010?000100000?00?00000000000000000000000000100
Spalacotherium_tricuspidens 0?10000000?0002100000000000110000000001000000000
Paurodon_valens    000??001011101?10010000001100001110011010000?011
Henkelotherium_guimarotae ???011?101?10111001000000111??11110011?10?1?0011
Drescheratherium_acutum  ???01?????????1100100000011????????????????????
Anthracolestes_sergeii  ??1??0????????????????????1011011021011001?0??
Amblotherium_pusillum  1?01?10101?101?2?0101100?11211111110211110111011
Amblotherium_gracile  1?1??1?1011101?200101100011211111110211110111011
Achyrodon_nanus    1?11211111?1013210101?0011121?11111121011011?111
Phascolestes_mustelulus  0001212111111321010110011121?1111112101111101111
Laolestes_eminens  11110111011101321[0 1]111110011211111111210110110011
Dryolestes_priscus  ???1?1?101210132111111010112111111112101101100?1
Dryolestes_leiriensis  111101110121013211111101011211111111210110110011
Krebsotherium_lusitanicum  1111111011101321111110011211111111210110110011
Guimarotodus_inflatus  111??111012101??????????????211111111210110110?11
Crusafontia_cuencana  101??121111111?210101100111211111110211111110111
Hercynodon_germanicus  ????????????????210101100111?1?111110?1111????????
Minutolestes_submersus  ????????????????211101100011?1?11111??11?1????????
Beckumia_sinemeckelia  ??1??11????????????????????211??1??1??10110111
;

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proc /;

comments 8

{0 45 90-100 grad: Luo et al., 2002: char. 25;

{1 45 120 grad;

{2 45 135 grad;

{3 45 115 grad: Luo et al., 2002: char. 25;

{9 45 110 grad;

{10 45 110 grad;

{13 45 120 grad;

{15 45 92 grad;

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SOM 2.

3D PDF Instructions

- 1.) For full functionality download the complete PDF file to your computer (if not fully downloaded the 3D functions might not be working properly).
- 2.) Open the PDF file, 3D Object appears in the center of the window.
- 3.) Click on the 3D item, it might take a second until a popup prompt appears asking if the 3D content should be enabled. Click box "options" and choose to "trust the document" from the drop down list.
- 4.) Now click again on the 3D item, it might take up to a minute to be ready (depending on your computer settings). When ready the 3D menu appears above the 3D item.
- 5.) The 3D model can now be manipulated in all directions using the mouse cursor.
- 6.) To toggle the view of different 3D elements (e.g., jaw bone, teeth) use the check boxes in the model hierarchy (left column in PDF viewer, first box).
- 7.) Some standard views (e.g., dorsal, ventral, lateral, medial) are preset (left column in PDF viewer, second box). To quickly navigate back to standard view click on the camera icon.

Data and file overview:

WMNM_P82308_Cifellitherium_r_upper_molar.pdf

Downloadable 3D-PDF file; movable 3D surface model of right upper molar of *Cifellitherium suderlandicum* gen. et sp. nov. from Busche Quarry near Balve, North Rhine-Westphalia, Germany, Barremian–Aptian (Lower Cretaceous).

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82308_Cifellitherium_r_upper_molar.pdf

WMNM_P82302_Cifellitherium_r_upper_molar.pdf

Downloadable 3D-PDF file; movable 3D surface model of left upper molar of *Cifellitherium suderlandicum* gen. et sp. nov. from Busche Quarry near Balve, North Rhine-Westphalia, Germany, Barremian–Aptian (Lower Cretaceous).

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82302_Cifellitherium_r_upper_molar.pdf

WMNM_P82305_Cifellitherium_r_lower_molar_holotype.pdf

Downloadable 3D-PDF file; movable 3D surface model of right lower molar of *Cifellitherium suderlandicum* gen. et sp. nov. (holotype) from Busche Quarry near Balve, North Rhine-Westphalia, Germany, Barremian–Aptian (Lower Cretaceous).

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82305_Cifellitherium_r_lower_molar_holotype.pdf

WMNM_P82306_Minutolestes_l_upper_molar.pdf

Downloadable 3D-PDF file; movable 3D surface model of left upper molar of *Minutolestes submersus* gen. et sp. nov. (holotype) from Busche Quarry near Balve, North Rhine-Westphalia, Germany, Barremian–Aptian (Lower Cretaceous).

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82306_Minutolestes_l_upper_molar_holotype.pdf

WMNM_P82304_Minutolestes_l_upper_molar.pdf

Downloadable 3D-PDF file; movable 3D surface model of right upper molar of *Minutolestes submersus* gen. et sp. nov. from Busche Quarry near Balve, North Rhine-Westphalia, Germany, Barremian–Aptian (Lower Cretaceous).

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82304_Minutolestes_l_upper_molar.pdf

WMNM_P82307_Minutolestes_l_lower_molar.pdf

Downloadable 3D-PDF file; movable 3D surface model of left lower molar of *Minutolestes submersus* gen. et sp. nov. from Busche Quarry near Balve, North Rhine-Westphalia, Germany, Barremian–Aptian (Lower Cretaceous).

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82307_Minutolestes_l_lower_molar.pdf

WMNM_P82301_Beckumia_l_mandible_holotype.pdf

Downloadable 3D-PDF file, movable 3D surface models of left mandible of *Beckumia sinemeckelia* (holotype) from Busche Quarry near Balve, North Rhine-Westphalia, Germany, Barremian–Aptian (Lower Cretaceous). Both elements (teeth and jaw bone) are separate 3D models and can be viewed separately.

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82301_Beckumia_l_mandible_holotype.pdf

WMNM_P82310_Beckumia_l_lower_premolar.pdf

Downloadable 3D-PDF file; movable 3D surface model of left lower premolar of *Beckumia sinemeckelia* gen. et sp. nov. from Busche Quarry near Balve, North Rhine-Westphalia, Germany, Barremian–Aptian (Lower Cretaceous).

http://app.pan.pl/SOM/app67-Martin_etal_SOM/WMNM_P82310_Beckumia_l_lower_premolar.pdf

MfN_Una1_Crusafontia_l_mandible_holotype.pdf

Downloadable 3D-PDF file; movable 3D surface model of left mandible of *Crusafontia cuencana* (holotype) from Uña locality, province of Cuenca, Spain, Barremian (Lower Cretaceous). Both elements (teeth and jaw bone) are separate 3D models and can be viewed separately.

http://app.pan.pl/SOM/app67-Martin_etal_SOM/MfN_Una1_Crusafontia_l_mandible_holotype.pdf

MfN_Una2_Crusafontia_r_mandible_paratype.pdf

Downloadable 3D-PDF file; movable 3D surface model of right mandible of *Crusafontia cuencana* (paratype) from Uña locality, province of Cuenca, Spain, Barremian (Lower Cretaceous).

http://app.pan.pl/SOM/app67-Martin_etal_SOM/MfN_Una2_Crusafontia_r_mandible_paratype.pdf